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AFPEA REPORT NO. 94-R-08
AFPEA PROJECT NO. 90-P-125

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Development of the Family of Munitions Container #1

AFMC-LSO/LGTP
AIR FORCE PACKAGING EVALUATION ACTIVITY
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NOVEMBER 1994

NOTICE

AFPEA PROJECT NO. 90-P-125
TITLE: Family of Munitions Container #1

ABSTRACT

An OO-ALC/MMW (presently OO-ALC/LIWDT) Process Action Team (PAT) came up with the idea to have a Family of Munitions Containers (FMC) of three to six containers to replace most of the Air Force's 200 munitions containers. OO-ALC realizing the potential of this idea initiated Productivity, Reliability, Availability, Maintainability (PRAM) project 21989-01. This report will deal with FMC number one (FMC #1), which is designed for fuses, boosters, and other small miscellaneous munitions. The container is a one person carrying container with a gross weight of 19.1 Kg (42 lb.). AFPEA's role was to design, fabricate, test and provide a Production Drawing Package to OO-ALC/LIWDT.

FMC #1, (CNU 532/E) was designed to be a welded aluminum, controlled breathing, reusable container. The container is constructed out of a two piece aluminum extrusion welded together, aluminum sheet makes up the bottom and a casting is used for the lid. The container has a cam-over-center latch, pressure relief valve, air filling valve, and a silicone rubber gasket will be used to seal the container. Stacking of the containers will use an integral feature included in the lid casting. The containers external finish will be bare aluminum. This will reduce maintenance costs and any adverse environmental impact caused by painting.

During the development of FMC #1 a deficiency in the sealing of the container developed and was attributed to a combination of the sealing interface and the small container volume. While FMC #1 will seal the reliability and repeatability of the sealing has been a serious question. This unreliable sealing interface has caused this project to be completed with the container not qualified for sealing.

MAN-HOURS: 2775

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PUBLICATION DATE: 28 NOV 94

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INTRODUCTION:

BACKGROUND:
An OO-ALC/MMW (presently OO-ALC/LIWDT) Process Action Team (PAT) came up with the idea to have a Family of Munitions Containers (FMC's) of three to six containers to replace most of the Air Force's 200 munitions containers. OO-ALC realizing the potential of this idea initiated Productivity, Reliability, Availability, Maintainability (PRAM) project 21989-01. This report will deal with FMC number one (FMC #1), which is designed for fuses, boosters, and other small miscellaneous munitions items. The container is a one person carrying container with a gross weight of 19.1 Kg (42 lb.). The internal dimensions of the container are 304.8 mm x 203.2 mm x 228.6 mm (12" x 8" x 9") or 0.01416 M^3 (0.5 ft^3). AFPEA's role was to design, fabricate, test and provide a Production Drawing Package for FMC #1 to OO-ALC/LIWDT.

REQUIREMENTS:
AFPEA in union with OO-ALC/LIWDT developed a Statement of Work (SOW) for the design of the FMC's. This SOW was developed by tailoring MIL-C-5584, Military Specification, Containers, Shipping and Storage, Metal, Reusable. The SOW, titled The Design Criteria for Family Group of Munitions Containers is attached in Appendix 1 and defines all of the criteria and requirements for the container designs.

DESIGN:

CONFIGURATION:

The Family of Munitions Container #1 is the Shipping and Storage Container CNU 532/E. This is a welded aluminum, semi-controlled breathing, reusable container. The container is constructed out of two aluminum extrusions, a casting for the lid and sheet aluminum for the bottom. The container has cam-over-center latches, a pressure relief valve, air filling valve, and a silicone foam rubber gasket. Stacking is accomplished by using the integral interlocking feature incorporated into the cast lid (see Appendix 4, figure 1). Palletized loads will be made easier with this container's stack ability. The containers external finish is bare aluminum. This cuts costs in painting and maintaining the container and reduces adverse environmental impact caused by painting. The overall volume of the container is approximately 0.014 M^3 (0.5 ft^3).

TESTING:

TEST SPECIMEN:

AFPEA fabricated two CNU 532/E prototype containers in house for testing (see Appendix 4, Figure 1). The prototype containers were fabricated IAW all the requirements and tolerances of the container drawing package. The same drawing package that will be released to OO-ALC/LIWDT for the manufacture of production quantities of the container.

TEST PLAN:

The test plan was designed, (IAW the Design Criteria for Family Group of Munitions Containers, MIL-C-5584, MIL-STD-648 and FED-STD-101), to qualify the CNU 532/E for transportation and storage in a world-wide environment. The only deviation from the original design criteria, Appendix 1, has been for the pressure or leak tests for this small container. This deviation was approved by OO-ALC/LIWDT and has been incorporated into the test plan for FMC #1. The approval for the new leak rate applies only to FMC #1 and is specifically due to the small volume of the container. The justification for the use of this deviation from the original design criteria is contained in the AFPEA Point Paper dated 28 Feb. 94, Appendix 2. The test plan includes all test procedures, test equipment, and pass/fail performance criteria for conducting complete qualification testing. See Appendix 3 for the complete test plan.

RESULTS:

The complete container test plan was conducted by AFMC-LSO/LGTPM on one of the two containers. The Qualification Test Report, Appendix 4, details the results of the tests. During the testing two anomalies appeared. First, during the drop testing the tabs on the ends of the lids (see Drawing # 9095153, Lid Casting) continued to fail by shearing and/or fracturing. This anomaly was corrected by testing lids manufactured from four different materials. It was determined through testing and by discussion with the manufacturer of the casting that #713 Tenzaloy was the best material. This alloy is the most ductile, making it more resistant to fracture. The second anomaly is that the container will not give a reliable and repeatable seal. It has been determined that there are several factors contributing to this factor. First, the original lids cracked and fractured during testing, causing leaks. This problem was corrected with the use of the new #713 Tenzaloy aluminum alloy lid. This material is much more durable and does not fracture, thus removing that leakage problem. Secondly, the original lids were extremely porous, requiring that they be vacuum impregnated to stop them from leaking pressure right through the actual material itself. Again the new #713 Tenzaloy is much less porous, due to its increased ductility, removing the need to vacuum impregnate the lids. The final suspected area of concern with the sealing integrity of FMC #1 is the gasket, lid, and base interface. The reliability and repeatability of this interface is questionable. Some examples encountered during testing are as follows. An optimum combination of down force on the latch will produce a sealed container. However, if during testing the down force increased then the seal is breached in the middle of the container, because the lid bows. Secondly, if the latches loosen, lowering the down force, then the container leaks in the one or more corners. Also abrasive damage to the gasket or the base sealing surface at times causes the container to leak and at other times does not effect the sealing integrity. It is this continual unreliability of the sealing that has caused FMC #1 to not be able to meet the leakage requirements after testing has started.

CONCLUSION:

The prototype container passed all the structural tests. The only exception to passing all the tests in the test plan was the unreliability of the leak test results. The FMC #1 would not reliably pass the leak tests. the container would pass the initial pressure and vacuum tests with leak rates well below the pass/fail criteria. However, after testing the pressure test results are extremely variable and difficult to reproduce. There are several variables that can not all be controlled. It was this difficulty in reproducing pressure test results that have lead to two decisions. First, the FMC #1 project has influenced the Defense Ammunition Packaging Council (DAPC) J-6 project on small munitions containers. The scope of the DAPC project was significantly influenced by the problems discovered with the small FMC #1 project. This DAPC project will develop an improved small container which has standardization of hardware, improved sealing, improved gaskets, and reduced tare weight. Thus it will further research several of the reliability problems that have become evident in working the FMC #1. Secondly, the FMC #1 project will be finished and closed even though the seal has not been made 100% reliable. This will be because current container will be completed as a non sealed container. Secondly, the DAPC small munitions container will be prototyped and tested using the lessons learned from FMC #1 and those improvements will be communicated to OO-ALC/LIWDT, thus insuring that they receive the highest quality small munitions container possible.

APPENDIX 1

DESIGN CRITERIA
FOR
FAMILY OF MUNITIONS CONTAINERS

28 Aug 91

DESIGN CRITERIA

FOR

A FAMILY OF MUNITIONS CONTAINERS

1. The Air Force Packaging and Evaluation Agency (AFPEA) will design three specific containers following the applicable military standards for container design requirements as well as user and program manager in puts. The below listed sizes have been determined by the program manager along with specific design specifications as listed in the following paragraphs.

INTERNAL DIMENSIONS

SIZE	LENGTH	WIDTH	HEIGHT	ITEM MAX WEIGHT
1	12	8	9	25 lb.
2	20.5	16.5	14	150 lb. CNTR GROSS WT.
3	49	38	33	675 lb.
* 4	100	39	26	2,000 lb.
** 5	180	45	23	Unknown

* Use CNU-411/E for this container.
** Use the new AUR missile container.

2. These containers will be designed for the maximum load weight and/or items in each container as indicated:

SIZE	ITEM
1	Design to maximum content weight.
2	Design to maximum content weight.
3	BSU 49/50 and MXU 650 Airfoil Group.
4	Use CNU-411 container for CBU 87/89, SUU 30-type, Mk 20, and similar type/size CBU munitions.
5	Use CNU 407 type container for all present and or future air to air missiles or other air munitions.

3. The Family of Munitions Containers shall be designed in accordance with MIL-C-5584D and options in MIL-C-5584.

A. Par. 1.2; Classification.

Sizes 1, 2, 4, and 5 Type II - Horizontal Mount

Size 3 Type I - Vertical Mount

B. Par. 3.2; First article. One container of each size (1, 2, and 3) shall be provided for first article testing, for each container design. A second container of each design shall be provided after completion of first article testing.

C. Par. 3.4; Design and construction. These containers shall be designed in metric units in accordance with Public Law 94-168, as amended by Public Law 100-418.

D. Par. 3.4.2.2; Cure date on shock isolation system. This applies to rubber products only.

E. Par. 3.4.3.1; Desiccant receptacle. Container sizes 2 and 3 shall have desiccant receptacles. Container 1 would not have a desiccant receptacle because of its small size. If required, desiccant can be placed inside container 1 by removing the cover then resealing.

F. Par. 3.4.3.2; Humidity indicator. A humidity indicator shall be provided on sizes 2 and 3. Note: A humidity indicator card may always be placed inside container size 1.

G. Par. 3.4.3.3; Pressure equalizing valve. All containers shall have a pressure relief/equalizing valve, with the following characteristics:

Cracking Pressure = 1.0 to 1.5 PSID
Full Open Pressure = 2.5 PSID
Reseal Pressure $\geq$ 0.5 PSID

Minimum Flow Rate (cubic feet/minute) = Vc * (0.12)
Vc = Volume of the Container (cubic feet)
Ref. MIL-V-27166, Par. 3.6.3

H. Par. 3.4.3.4; Visual inspection ports. N/A

I. Par. 3.4.3.5; Air filling valve. An air filling valve will be provided on containers 1, 2, and 3.

J. Par. 3.4.3.6; Record receptacle. N/A

K. Par. 3.4.3.7; Drain plug. N/A

L. Par. 3.4.3.8; Fuel leak detector. N/A

M. Par. 3.4.4; Handling provisions. Investigate the use of spring loaded handles on container 1.

N. Par. 3.6.1; Item testing/inspection. N/A

O. Par. 3.6.2; Item uploading. N/A

P. Par. 3.6.3; Installation time. N/A

Q. Par. 3.6.5; Shock transmission. Container 3, BSU 49, 50 and MXU 650 fins, require physical and mechanical protection only. The other container designs require testing to the maximum weight, therefore, shock transmission is not a concern.

R. Par. 3.6.5.1; UN drop test. Container sizes 1 and 2 shall be tested to category A, at the maximum weight, unless actual items are used.

S. Par. 3.6.8; Size and weight. The containers shall be designed to the internal sizes and for the weights specified in paragraphs 1 and 2 above.

T. Par. 3.9.1; Aluminum. The container shall be treated as defined in 1 below. An alternate method of finishing aluminum products shall be as specified in 2 below.

(1) The exterior of the container shall be bead blasted with plastic media. NOTE: this is pending MAJCOM's approval.

(2) The painting of aluminum shall be as follows:

Aluminum surfaces shall be cleaned, pretreated, primed and painted in accordance with MIL-STD-171E. Cleaning shall be in accordance with Finish 5.2, MIL-STD-171E. The container shall have an immersion cleaning in accordance with TT-C-490C(1), Method III, Type III, then rinsed, followed by a force drying. This shall be followed by a spray application of wash primer DOD-P-15328D(1). Priming and finish shall be in accordance with Finish 20.9, MIL-STD-171E, see Section 5.3 of MIL-STD-171E. The primer used shall meet the requirements of MIL-P-23377F, followed with two (2) coats of topcoat TT-E-515A(1).

U. Par. 3.12; Installation instructions. N/A

V. Par. 4.7.7.1 & 4.7.7.2; Vibration tests will not be conducted unless the actual/dummy load is being tested. When testing to a maximum weight per container vibration tests will not be required.

W. Para. 4.7.5.2; Latch strength for containers 1 and 2 shall be 500 lb.

APPENDIX 2

POINT PAPER:
LEAKAGE REQUIREMENTS
FOR
SMALL CONTAINERS

28 FEB 94

Point Paper

SUBJECT: Leakage Requirements for Small Containers.

BACKGROUND:

The Air Force Packaging Evaluation Activity (AFPEA) has been conducting container certification testing on a small munitions container for the Family of Munitions Containers (FMC) Project. This project was to design and prototype a family of three containers to reduce the number of different containers in inventory. The volumes of the containers are as follows: FMC #1 0.5 ft^3, FMC #2 2.1 ft^3, and FMC #3 38.25 ft^3. As the volume of a container decreases the sensitivity to environmental and pressure changes make leak rate testing difficult. It is this sensitivity that will be addressed in this paper.

In the course of testing FMC #1 it has been discovered that the pressure testing requirements stated in MIL-STD-648 are very difficult if not impossible to meet in our prototypes and will be virtually impossible to meet in a production mode. MIL-STD-648, paragraph 5.5.2, allows a 0.05 psi/hr leak rate. When testing a small container like FMC #1 it is difficult to maintain this leak rate. The volume loss required to cause a 0.05 psi/hr leak rate at a test pressure of 1.5 psig for FMC #1 is 2.67 in^3/hr (see appendix 1). In comparison, looking at the larger FMC #3, a volume loss of 204.0 in^3/hr results in the same 0.05 psi/hr leak rate at a test pressure of 1.5 psig. This vast difference in flow rate for the same pressure loss has lead AFPEA to investigate other pressure test methods for small containers.

DISCUSSION:

There are two approaches in conducting pressure tests. The first is the current approach used by AFPEA and described in MIL-STD-648, paragraph 5.5.2. This is the use of a constant pressure loss. The problem with the use of a constant pressure loss is that the smaller the container the smaller the volume of gas that it can lose. Thus, at extremely small container volumes there is an unrealistic restriction on the volume of gas lost during the pressure test. This is shown for four volumes in table I, under the AFPEA requirements column. Looking at the values of FMC #1 there is only a 2.6 in^3/hr volumetric loss. This volume being so small it is extremely difficult to maintain this type of seal.

The Army Packaging Group utilizes a secondary approach to pressure testing, a volumetric loss approach. A flow rate of 5 cm^3/minute (18.31 in^3/hr) is used as the passing criteria for small containers. This volumetric rate is base on a 21 Dec 89 Information Paper titled "LEAKAGE REQUIREMENTS FOR SEALED CONTAINERS." The problem with the use of a constant volume loss is that for large containers it places an unrealistic sealing requirement on the container. This is shown for four different container volumes in table I, under the Army requirements column. If the values for FMC #3 are investigated it can be seen that using a constant volume leak rate of 18.31 in^3/hr produces an almost impossible to maintain leak rate of 0.0045 psi/hr.

Table I

FMC	V(in^3)	AFPEA (Requirements)	Army (Requirements)
#1	864.0	0.050 psi/hr (2.6 in^3/hr)	0.34 psi/hr (18.3 in^3/hr)
#2	3546.0	0.050 psi/hr (11.0 in^3/hr)	0.083 psi/hr (18.3 in^3/hr)
**	5932.4	0.050 psi/hr (18.3 in^3/hr)	0.050 psi/hr (18.3 in^3/hr)
#3	66094.0	0.050 psi/hr (204.0 in^3/hr)	0.0045 psi/hr (18.3 in^3/hr)

If a comparison of the Pressure tests of the Army and AFPEA are investigated, table I, several points are apparent. First for the small containers the Army has a more realistic pressure test. In comparison AFPEA has a more realistic test for the larger containers. If the container has a volume of 5932.4 in^3 both the pressure and volumetric loss requirements used by the Army and AFPEA are the same. This leads to a natural breaking point for using one set of test criteria over the other, depending on the volume of the container.

CONCLUSION:

The comparison of both methods show a natural, yet theoretically distinct approach to pressure testing containers. As shown in Table I there is an obvious difference in both the pressure and volumetric values depending on whether you are testing a small container of approximately 800 in^3 or a relatively large container of over 66000 in^3. Both historical data and experience gained by the Army Packaging Group and AFPEA validate their respective methods in some cases and identify significant problems in others. The question may not be which method is correct, it may be when is it more correct to use one method over the other. The goal is to provide adequate protection during long term storage at a reasonable cost. Therefore at specific instances of volume, one of the test methods may be too restrictive thus causing the cost of the container to increase without increasing the value or level of the protection.

RECOMMENDATIONS:

It is recommended that the experience of both services be put to use by using the strengths of both. The experience of the Army with the testing of small containers coupled with the current difficulty AFPEA has encountered with the sensitivity of pressure/leak testing small containers leads to the recommendation that for containers under approximately 5000 in^3 a volumetric leak rate of 18.3 in^3/hr (5 $cm^3/minute$) be used. It is also recommended that since the experience and positive results AFPEA has obtained in containers over 5000 in^3 the current pressure based leak rate of 0.05 psi/hr be maintained. This way the experience of both services is put to use and assets remain protected while in storage without incurring costs seen with unrealistic pressure/leakage requirements that add no value to the system.

Appendix 1

Volume/Pressure Calculations

Ideal Gas Law: $PV = (W/M)RT$

Where:
- P = Absolute Pressure (psi)
- V = Container Volume (in^3)
- W = Weight of Gas
- M = Molecular Weight of Gas
- R = Ideal Gas Constant
- T = Absolute Temperature ($^{\circ}R$)

$$(\partial P/\partial W)_{T,V} = (RT/MV)_{T,V} = P_o/W_o$$

$$(\partial V/\partial W)_{T,P} = (RT/MP)_{T,P} = V_o/W_o$$

$$\partial V/\partial P = (\partial V/\partial W)_{T,V}/(\partial P/\partial W)_{T,P} = (V_o/W_o)/(P_o/W_o) = V_o/P_o$$

Volume Leak Rate (in^3/hr): $\Delta V/\Delta t = (V_o/P_o)(\Delta P/\Delta t)$

Pressure Leak Rate (psi/hr): $\Delta P/\Delta t = (P_o/V_o)(\Delta V/\Delta t)$

Using : P_o = 1 Atm + 1.5 psi = 16.2 psi (Absolute)
V_o = Internal Volume of the Sealed Container

APPENDIX 3

TEST PLAN

AIR FORCE PACKAGING EVALUATION ACTIVITY (Contianer Test Plan)					AFPEA PROJECT NUMBER: 90-P-125
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR: 305 x 205 x 243	EXTERIOR: 383 x 235 x 267	WEIGHT (Kgs) GROSS: 19.1 / ITEM:	CUBE (CU. M) 0.015194	QUANTITY: 1	DATE: 28 Sept 94
ITEM NAME: N/A - (no item assigned to container)			MANUFACTURER: Prototype by AFPEA		
CONTAINER NAME: Family of Munitions Container #1					CONTAINER COST:
PACK DESCRIPTION: Aluminum Container, Test Load of wood and misc. objects, (Gross Wt. 19.1 Kg)					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
1.	EXAMINATION OF PRODUCT *(4.7.1), (4.8)	The container shall be examined to determine conformance with the materials, design, Table I (MIL-C-5584), applicable drawings, and Statment of Work.	Fully Assembled Container Ambient Temp.	Visual Inspection (VI)
2.	WEIGHT TEST (4.7.10)	Container tare weight shall not be greater than 7.73 Kg (17 Lbs). Gross weight to be 19.1 Kg (42 Lbs).	Fully Assembled Container Ambeaint Temp.	Scale
3.	FORM AND FIT TEST (4.7.3)	The container shall be inspected for proper form and fit. Operation of the closure fasteners and the service and maintance facilities shall be accomplished.	Fully Assembled Container Ambient Temp.	VI
4.	LEAK TEST FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 KPa (1.50 PSI) and pneumatic vacuum at -10.34 KPa (-1.50 PSI). 2367.0 Pa/hr (0.3433 PSI/hr) Leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes. For information on the leakage requirement see AFPEA Point Paper 28 Feb 94. This paper discusses the reasoning and the mathamatics behind this requirement.	Test performed in ambient condition from compressed air supply/vacuum pump.	Pressure Transducer or Water Manometer

COMMENTS:
* Figures in parenthesis () refer to paragraphs in MIL-C-5584D.

PREPARED BY:	APPROVED BY:
Ronald DeLuga, Mechanical Engineer	Ted Hinds, Chief, Design Group, AFPEA

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AIR FORCE PACKAGING EVALUATION ACTIVITY (Contianer Test Plan)					AFPEA PROJECT NUMBER: 90-P-125	
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR: 305 x 205 x 243	EXTERIOR: 383 x 235 x 267	WEIGHT (Kgs) GROSS: 19.1	ITEM:	CUBE (CU. M) 0.015194	QUANTITY: 1	DATE: 28 Sept 94
ITEM NAME: N/A - (no item assigned to container)				MANUFACTURER: Prototype by AFPEA		
CONTAINER NAME: Family of Munitions Container #1					CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of wood and misc. objects, (Gross Wt. 19.1 Kg)						
CONDITIONING: As noted below						

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
5.	ROUGH HANDLING TESTS FED-STD-101 Method 5007.1 (4.7.7.2.4)	Free fall drop test. Condition to -40° C +0/-5° C (-40° F). Drop height 635 mm (25 in). Container shall be loaded to a gross wt. of 19.1 Kg (42 Lbs). Conduct only 14 drops (ie. top, and half of the faces, edges and corners) the remaining drops will be conducted in test # 7.	Procedure A, one drop on each flat face, edge, and corner (13 drops).	VI
6.	LEAK TEST FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 KPa (1.50 PSI). 2367.0 Pa/hr (0.3433 PSI/hr) Leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply/vacuum pump.	Pressure Transducer or Water Manometer
7.	ROUGH HANDLING TESTS FED-STD-101 Method 5007.1 (4.7.7.2.4)	Free fall drop test. Condition to +60° C +5/-0° C (+140° F). Drop height 635 mm (25 in). Container shall be loaded to a gross wt. of 19.1 Kg (42 Lbs). Conduct only 14 drops (ie. bottom, and half of the faces, edges and corners) the remaining drops will be conducted in test # 5.	Procedure A, one drop on each flat face, edge, and corner (13 drops).	VI

COMMENTS: * Figures in parenthesis () refer to paragraphs in MIL-C-5584D.	
PREPARED BY: Ronald DeLuga, Mechanical Engineer	APPROVED BY: Ted Hinds, Chief, Design Group, AFPEA

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AIR FORCE PACKAGING EVALUATION ACTIVITY (Contianer Test Plan)				AFPEA PROJECT NUMBER: 90-P-125	
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR: 305 x 205 x 243	EXTERIOR: 383 x 235 x 267	WEIGHT (Kgs) GROSS: 19.1 ITEM:	CUBE (CU. M) 0.015194	QUANTITY: 1	DATE: 28 Sept 94
ITEM NAME: N/A - (no item assigned to container)			MANUFACTURER: Prototype by AFPEA		
CONTAINER NAME: Family of Munitions Container #1				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of wood and misc. objects, (Gross Wt. 19.1 Kg)					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
8.	LEAK TEST FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 KPa (1.50 PSI). 2367.0 Pa/hr (0.3433 PSI/hr) Leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply/vacuum pump.	Pressure Transducer or Water Manometer
9.	REPETITIVE SHOCK MIL-STD-648 Para. 5.2.2, FED-STD-101 Method 5019.1, (4.7.7.3)	Test for not less than two hours at 3 to 5 Hz or 1G, whichever is less, and 25.4 mm double amplitude.	Ambient.	VI
10.	LEAK TEST FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 KPa (1.50 PSI). 2367.0 Pa/hr (0.3433 PSI/hr) Leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply/vacuum pump.	Pressure Transducer or Water Manometer

COMMENTS:
* Figures in parenthesis () refer to paragraphs in MIL-C-5584D.

PREPARED BY:	APPROVED BY:
Ronald DeLuga, Mechanical Engineer	Ted Hinds, Chief, Design Group, AFPEA

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AIR FORCE PACKAGING EVALUATION ACTIVITY (Contianer Test Plan)				AFPEA PROJECT NUMBER: 90-P-125	
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CONTAINER NAME: Family of Munitions Container #1				CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of wood and misc. objects, (Gross Wt. 19.1 Kg)					
CONDITIONING: As noted below					

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
11.	HANDLE PULL TEST			
	(4.7.4) Modified a. MIL-STD-648 Para 4.17.2.1 (c) and 5.8.3	The container shall be loaded to five (5) times the gross weight, 95.5 Kgs (210.0 Lbs.). It shall then be hiosted by each handle and allowed to hang for a minimum of five (5) minutes. No permement deformation or damage shall be evident.	Ambient	Scale
	b. MIL-STD-648 Para 5.8.4	The container handles shall have a force of 95.5 Kg (210Lbs) applied on the handle in each of the possible directions that may result from shipment. These four are; straight out, straight up, downward at 45° from horizontal and simultaneously 45° outboard (left) from the container, and downward at 45° from horizontal and simultaneously 45° outboard (right) from the container.	Ambient	Scale
12.	STAND-OFF TEST			
	(4.7.5.1)	Place load two times the cover weight 10 Kg (22 Lbs) on cover. The cover shall not deform or deflect. With load removed slide cover on the standoffs 1.53 M (5 ft) in each of four different directions. There shall be no damage to the sealing gasket.	Ambient Place container cover on a concrete floor resting on the stand-offs.	VI

COMMENTS:
* Figures in parenthesis () refer to paragraphs in MIL-C-5584D.

PREPARED BY:	APPROVED BY:
Ronald DeLuga, Mechanical Engineer	Ted Hinds, Chief, Design Group, AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY (Contianer Test Plan)					AFPEA PROJECT NUMBER: 90-P-125	
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR: 305 x 205 x 243	EXTERIOR: 383 x 235 x 267	WEIGHT (Kgs) GROSS: 19.1	ITEM:	CUBE (CU. M) 0.015194	QUANTITY: 1	DATE: 28 Sept 94
ITEM NAME: N/A - (no item assigned to container)				MANUFACTURER: Prototype by AFPEA		
CONTAINER NAME: Family of Munitions Container #1					CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of wood and misc. objects, (Gross Wt. 19.1 Kg)						
CONDITIONING: As noted below						

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
13.	SUPERIMPOSED LOAD			
	MIL-STD-648 Para. 5.7.2 (4.7.6.1)	Test load shall be a loaded container with a maximum gross weight of 19.1 Kg (42 Lbs). A superimposed load shall be equal to a 4.9 M (16 ft) stack of loaded containers times a factor of safety of 2. Stack for 1 hour. The load is 725 Kg (1596.8 Lbs).	Bottom container is container tested at ambient.	Record Changes Visual Inspection
14.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.7.2)	Pneumatic pressure at 10.34 KPa (1.50 PSI). 2367.0 Pa/hr (0.3433 PSI/hr) Leakage allowed after temperature stabilization. Test duration to be a minimum of 30 minutes.	Test performed in ambient condition from compressed air supply/vacuum pump.	Pressure Transducer or Water Manometer
15.	LATCH ASSEMBLY STRENGTH TEST			
	(4.7.5.2) Modified	Apply a tensile force of not less than 365 Kg (800 Lbs) to the latch assembly in the closed configuration. The latch shall not have permanent deformation and rivets shall not fail. Test two latches back to back and take the average load for one latch. Certification from the latch assembly manufacturer is acceptable.	Ambient	Tensile Tester and Visual Inspection

COMMENTS:
* Figures in parenthesis () refer to paragraphs in MIL-C-5584D.

PREPARED BY:	APPROVED BY:
Ronald DeLuga, Mechanical Engineer	Ted Hinds, Chief, Design Group, AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY (Contianer Test Plan)						AFPEA PROJECT NUMBER: 90-P-125	
CONTIANER SIZE (L x W x D) (MILLIMETERS) INTERIOR:	EXTERIOR:	WEIGHT (Kgs) GROSS:	ITEM:	CUBE (CU. M)		QUANTITY:	DATE:
305 x 205 x 243	383 x 235 x 267	19.1		0.015194		1	28 Sept 94
ITEM NAME: N/A - (no item assigned to container)				MANUFACTURER: Prototype by AFPEA			
CONTAINER NAME: Family of Munitions Container #1						CONTAINER COST:	
PACK DESCRIPTION: Aluminum Container, Test Load of wood and misc. objects, (Gross Wt. 19.1 Kg)							
CONDITIONING: As noted below							

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
16.	STRUCTURAL PRESSURE/VACUUM TEST			
	MIL-STD-648 Para. 5.5.2 & 5.5.3	Container shall be subjected to a pressure of 20.68 KPa (3.0 PSI) and a vacuum of 20.68 KPa (-3.0 PSI). Remove pressure relief valve and cap/seal/plug/ opening. The container shall not fail in a dangerous catastrophic manner (loss of seal integrity is permissible).	Ambient	Pressure Transducer or Water Manometer
17.	UN (POP) DROP TESTING			
	CFR Title 49 Para. 178.603 1992 edition (4.7.7.2.5)	Container shall undergo UN (POP) Drop Testing. The container shall not leak or spill any of the contents. Safe disposal of the container shall be possible. Drop height shall be 1.2 M (47.2 in.)	Ambient, perform the 5 drops in this order; flat bottom, flat top, flat long side, flat short side, and most vulnerable corner (any top corner).	Visual Inspection.

COMMENTS:
* Figures in parenthesis () refer to paragraphs in MIL-C-5584D.

PREPARED BY:	APPROVED BY:
Ronald DeLuga, Mechanical Engineer	Ted Hinds, Chief, Design Group, AFPEA

APPENDIX 4

QUALIFICATION TEST REPORT

APPROVED FOR PUBLIC RELEASE
DISTRIBUTION UNLIMITED

92-P-114

KEITH A. VOSSLER

Mechanical Engineer

DSN: 787-4519

Commercial: (513) 257-4519

FAMILY OF MUNITIONS CONTAINER NUMBER 1

CNU-532/E

AFMC-LSO/LGTP
5215 THURLOW ST BLDG 70
WRIGHT-PATTERSON AFB OH 45433-5540

NOVEMBER 1994

INTRODUCTION

The objective of this test series was to qualify the Family of Munitions Container Number 1 (FMC 1), CNU-532/E, for production release by AFMC-LSO/LGTP.

CONTAINER DESCRIPTION

The Family of Munitions container Number 1, CNU-532/E, is a small sized (under 50 pounds), sealed aluminum container for transportation and storage of miscellaneous munitions such as fuses and boosters (Figure 1). The container consists of a cover and a base (Figure 2). Maximum outer container dimensions are 12 inches length, 8 inches width, and 9.5 inches depth.

TEST PROCEDURE

The CNU-532/E Container was tested in accordance the Air Force Packaging Evaluation Activity (AFPEA) Project Number 90-P-125, dated 28 Sep 94, which referenced MIL-C-5584D, MIL-STD-648A, and FED-STD-101C. The Test Project Number was 92-P-114.

The test methods constitute both the procedure for performing the tests and performance criteria for evaluation of container acceptability. The tests are commonly applied to special shipping containers providing rough handling protection to sensitive items. The tests were performed at AFMC-LSO/LGTP, 5215 Thurlow St, Bldg 70, Wright-Patterson AFB, OH 45433-5540.

The container passed all testing up to Test Sequence 6, Leak Test. Submersion in water indicated air leakage at the four corners of the container at the gasket. Tightening the container latches stopped the corner leakage, but produced gasket leakage on both sides at the midpoint of the container length. The test plan was completed without further Test Plan Leak Tests being conducted. The container passed all remaining Test Plan Physical Tests.

CONTAINER FACE IDENTIFICATION

The correlation between numbered and designated container sides is as follows (Figure 3):

NUMBERED SIDE	DESIGNATED SIDE
1	Top
2	Forward (Pressure Relief Valve)
3	Bottom
4	AFT
5	Left
6	Right

TEST SEQUENCES

TEST SEQUENCE 1 - MIL-C-5584D, 4.7.1, Examination of Product and 4.8, Inspection of Packaging.

A visual inspection of the container was made. The container was equipped with a pressure relief valve, Schrader 645E6 valve, 2 cover latches, 2 manual lift handles, and cover with a stacking feature.

Container workmanship was visually examined. The container was free of defects that would affect strength, durability, safety, or serviceability. Container welds appeared uniform and the container was smooth and free of sharp or jagged edges.

Container color, finish, marking, identification, installation instructions, and drawings were not examined. Inspection of packaging was not performed.

TEST SEQUENCE 2 - MIL-C-5584D, 4.7.10, Weight Test.

The following equipment and instrumentation was utilized:

EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CALIBRATION EXPIRATION
Scale	Howe		A057229	01 May 95
Scale	Circuits & Systems	BX-100	5992A	May 95

The container base weighted 13.08 pounds. The cover weighted 3.18 pounds for a total container weight of 16.26 pounds. Gross weight of container and load was 42 pounds.

TEST SEQUENCE 3 - MIL-C-5584D, 4.7.3, Form and Fit Test.

The container closed and sealed. The pressure relief and Schrader valves, latches, and handles were examined and operated.

TEST SEQUENCE 4 - FED-STD-101C, Method 5009.3, Leaks in Containers, and MIL-C-5584D, 4.7.2, Pressure Test.

The following equipment and instrumentation was utilized:

EQUIPMENT	**MANUFACTURER**	**MODEL**	**SERIAL NUMBER**	**CALIBRATION EXPIRATION**
Digital Manometer	Yokogawa	26555-22	82DJ6009	11 Jun 93
Vacuum/ Pressure Pump	Thomas Industries	TA-0040-V	34DA72080A	N/A

The container pressure relief valve was removed and the relief valve hole was used for attachment of the digital manometer and vacuum/pressure pump lines. The empty container was closed and sealed. The leak tests were conducted in accordance with FED-STD-101C, Method 5009.3, at ambient temperature and pressure.

The pneumatic pressure leak technique (Figure 4) was utilized and the container pressurized to 1.5 pounds per square inch (psi). The container leak rate was 0.069 psi/hour (psi/hr) which was less than the maximum allowable leakage rate of 0.343 psi/hr (reference Test Plan).

The vacuum retention leak technique was utilized and the container evacuated to -1.5 psi. The container leak rate was 0.046 psi/hr which was less than the maximum allowable leakage rate of 0.343 psi/hr (reference Test Plan).

TEST SEQUENCES 5 and 7 - FED-STD-101C, Method 5007.1, Free Fall Drop Test and MIL-C-5584D, 4.7.7.2.4, Free Fall Drop Test.

The following equipment was utilized:

EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CALIBRATION EXPIRATION
Temp/altitude Chamber	Tenney Engineering	64ST	11,830	28 Jan 95
Drop Tester	L.A.B.	AS-160	106018	N/A

The free fall drop tests were conducted in accordance with FED-STD-101C, Method 5007.1. The container and test load (Figure 5) were conditioned at -40° F (Test Sequence 5) and +160° F (Test Sequence 7) and transported to the Conditioning Laboratory to be released from the drop tester.

The container was dropped 25 inches (Level A packaging protection) onto the drop tester steel plate. Procedure A for rectangular containers was utilized in which one drop was made on each flat face (Figure 6), edge (Figure 7), and corner (Figure 8), (total of 26 drops), with half of the drops (13) made at low temperature and half (13) at high temperature.

On the cold drops, the bottom and top corners were rounded (Figure 9). The Side 4 handle did not swing up as freely as before dropping, but was still functional.

On the hot drops, the bottom and top corners were rounded. One staple holding the hook and latch fastener to the handle came loose. The Design Engineer determined that the level of damage sustained was acceptable since the container was still functional.

TEST SEQUENCE 6 - FED-STD-101C, Method 5009.3, Leaks in Containers and MIL-C-5584D, 4.7.2, Pressure Test.

Reference Test Sequence 4 (Initial test description).

The container leak rate was more than the maximum allowable leakage rate of 0.343 psi/hr (reference Test Plan Test Procedure).

To determine whether the container was a structural or gasket leak, MIL-C-4150J, 4.6.3.2.1, Leak Test (Submersion), was performed. The following equipment and instrumentation was utilized:

EQUIPMENT	**MANUFACTURER**
Water Tank	AFMC-LSO/LGTP

The empty container was submerged so that the uppermost surface was beneath the water surface not less than one inch or more than two inches (Figure 10). Submersion in water indicated air leakage at the four corners of the container at the gasket. Tightening the container latches stopped the corner leakage, but produced gasket leakage on both sides at the midpoint of the container length. The cover gasket seals on one extrusion wall edge. The gasket material experienced cuts but not where the leaks occurred. Testing continued to determine the structural integrity of the container.

TEST SEQUENCE 8 - FED-STD-101C, Method 5009.3, Leaks in Containers and MIL-C-5584D, 4.7.2, Pressure Test.

Test not performed. Reference Test Sequence 6.

TEST SEQUENCE 9 - MIL-STD-648A, 5.2.2, Repetitive Shock Test, FED-STD-101C, Method 5019.1, Vibration (Repetitive Shock Test, and MIL-C-5584D, 4.7.7.3, Repetitive Shock (Superimposed Loads).

The following equipment was utilized:

EQUIPMENT	**MANUFACTURER**	**MODEL**	**SERIAL NUMBER**	**CALIBRATION EXPIRATION**
Vibration Control	Data Physics Corp	DP540	Ver 1.22 7 CH, DWL	N/A
Vibration Machine	LAB	41012432	89003	N/A
Vibration Controller	LAB	8830	88307	N/A
Low Pass Signal Filter	Krohn-Hite	3343	1943	N/A
Table Accelerometer	Endevco	2233E	AY29	01 Nov 94
Table Charge Amplifier	Endevco	2740BT	FW26	08 Feb 95

The test was conducted in accordance with FED-STD-101C, Method 5019.1, at ambient temperature.

The container and load was placed on the vibration table (Figure 11). Restraints were utilized that would prevent the container from sliding off the table. The container was allowed about 1/2 inch unrestricted movement in the horizontal direction from the centered position on the table.

The table frequency was increased from 0.0 Hertz (Hz) until the container left the table surface. At one inch double amplitude, a 1/16 inch thick metal bar could be slid freely between table and the container under all points of the container. Test duration was two hours. Test frequency varied from 4.78 to 5.0 Hz when readings were taken.

Visual inspection revealed no damage to the container.

TEST SEQUENCE 10 - FED-STD-101C, Method 5009.3, Leaks in Containers and MIL-C-5584D, 4.7.2, Pressure Test.

Test not performed. Reference Test Sequence 6.

TEST SEQUENCE 11 - Handle Pull Tests (Modified).

The following equipment was utilized:

EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER
Hoist	Coffing	3 Ton	SRD-112-CP
Tie-down Tester	AFMC-LSO/LGTP	N/A	N/A

TEST SEQUENCE 11A - MIL-STD-648, 4.17.2.1 (c), Handle Characteristics, 5.8.3, Hoisting Fittings Strength Test, and MIL-C-5584D, 4.7.4, Handling Provisions Test.

The container was lifted completely off the ground for 5 minutes by a handle with a 210 pound load (Figure 12). This load represented at least five times the gross container weight. There was no damage or permanent deformation to the handles or container sidewalls.

TEST SEQUENCE 11B - MIL-STD-648, 5.8.4, Tie down Strength Test.

This Test Sequence was conducted on a previously constructed container before the complete container test series started. The handle was fabricated from 0.375 inch diameter rod and with keepers were attached.

The container was placed on the AFMC-LSO/LGTP tie-down tester and restrained. The minimum required tie down force was calculated to be 210 pounds. A force in excess of this was applied by a hydraulic cylinder/load cell through a chain looped through a handle for one minute. The load was applied straight out (Figure 13) and up with no deformation. The load was also applied straight out at a 45° angle to each side of the handle (Figures 14 and 15) with slight deformation of the plastic in front of handle in both cases.

The Design Engineer determined that the deformation sustained was acceptable since the handle was still functional.

TEST SEQUENCE 12 - MIL-C-5584D, 4.7.5.1, Cover Stand Off Test.

The container cover (resting on the container stand offs) was placed on a flat, level, rigid floor. A 7 pound load, representing the container cover weight, was placed on top of the container cover representing a force of two times the container cover weight on the standoffs (Figure 16).

The container cover and load were slid 5 feet across a concrete floor on the container stand offs in four different directions. The container stand offs and gasket sealing area did not deform or sustain damage.

TEST SEQUENCE 13 - MIL-STD-648A, 5.7.2, Load Test (Stack ability) Test and MIL-C-5584D, 4.7.6.1, Load Resistance.

The following equipment was utilized:

EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER
Forklift Truck 4000 pounds	Mercury	401P	147976

The container containing the load was placed on a flat, level, rigid surface. A 1630 pound load was applied to simulate a stacking load on the container top (Figure 17).

The load remained in place for one hour. A visual inspection of the container was made when the load was removed. No container deformation was noted. The cover gasket was heavily indented, but there was no apparent damage.

TEST SEQUENCE 14 - FED-STD-101C, Method 5009.3, Leaks in Containers and MIL-C-5584D, 4.7.2, Pressure Test.

Test not performed. Reference Test Sequence 6.

TEST SEQUENCE 15 - MIL-C-5584D, 4.7.5.2, Latch Strength Test.

Each latch was required to withstand a tensile load of 4500 pounds applied axially to the draw bolt without permanent deformation. The latch manufacturer submitted a Certification of Compliance to meet this requirement. (See container design portion of report).

TEST SEQUENCE 16 - MIL-STD-648, 5.5, Structural Integrity.

Reference Test Sequence 4 (Initial test description).

TEST SEQUENCE 16A - MIL-STD-648, 5.5.2, Pressure Test.

The container was pressurized to 3.0 psi. There was no failure of the latches, fasteners, or container structure.

TEST SEQUENCE 16B - MIL-STD-648, 5.5.3, Vacuum Test.

The container was evacuated to -3.0 psi. There was no failure of the latches, fasteners, or container structure.

TEST SEQUENCE 17 - MIL-C-5584D, 4.7.7.2.5, UN Drop Test.

Reference Test Sequences 5 and 7 (Initial test description).

The container and test load were dropped 47.2 inches onto the drop tester steel plate at ambient temperature. One flat drop was made on Sides 3, 1, 6, and 2 (Figure 18). A drop was made on Corner 146. The same container was used for all drops. There was no spillage of the container contents.

The handle on Side 4 bound when raised to the vertical position. The plastic block in container Corner 146 was pushed further into the extrusion cavity. Cover corner 146 standoff was bent. The cover stand offs bent the Sides 2 and 4 wall extrusions near the corner extrusion cavities.

To determine whether the container had developed structural leaks, MIL-C-4150J, 4.6.3.2.1, Leak Test (Submersion) was repeated. No additional leakage points (reference Test Sequence 6) were observed.

APPENDIX 1

PHOTOGRAPHS

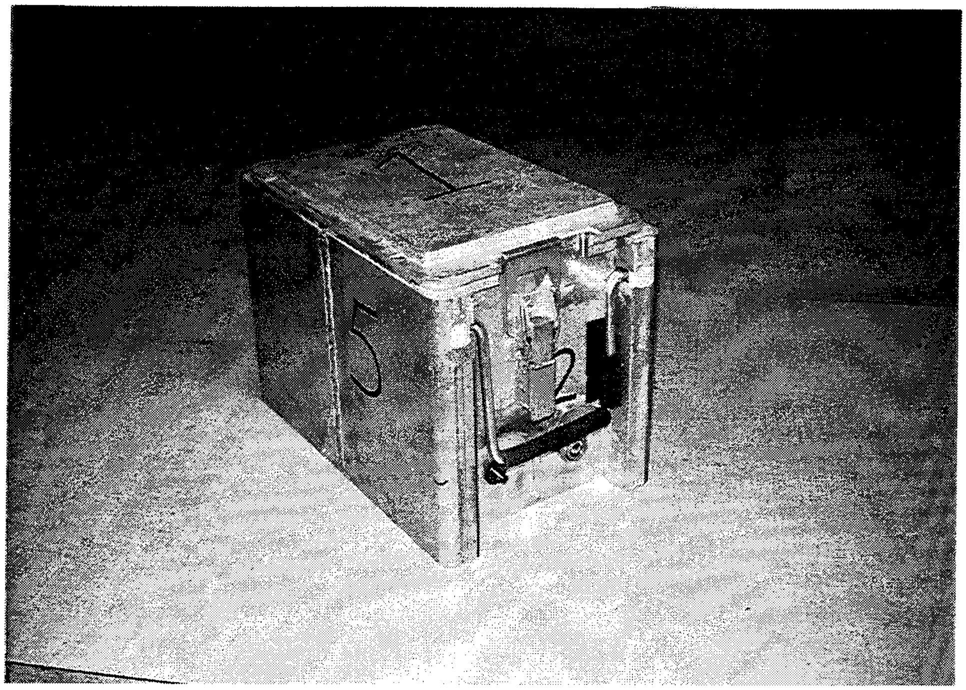

Figure 1. CNU-532/E.

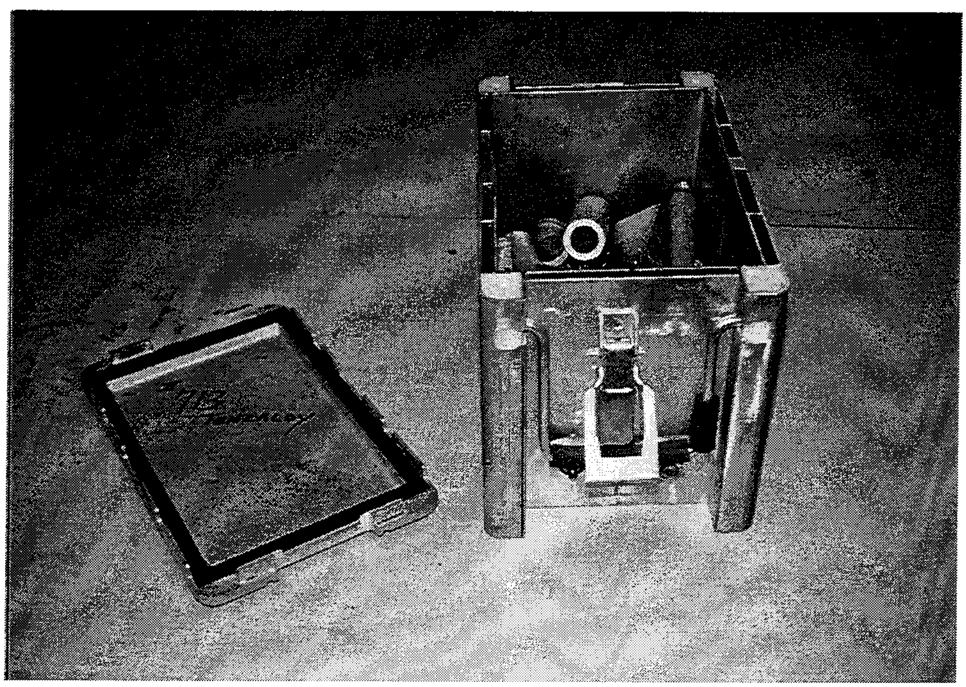

Figure 2. CNU-532/E - Container and Base.

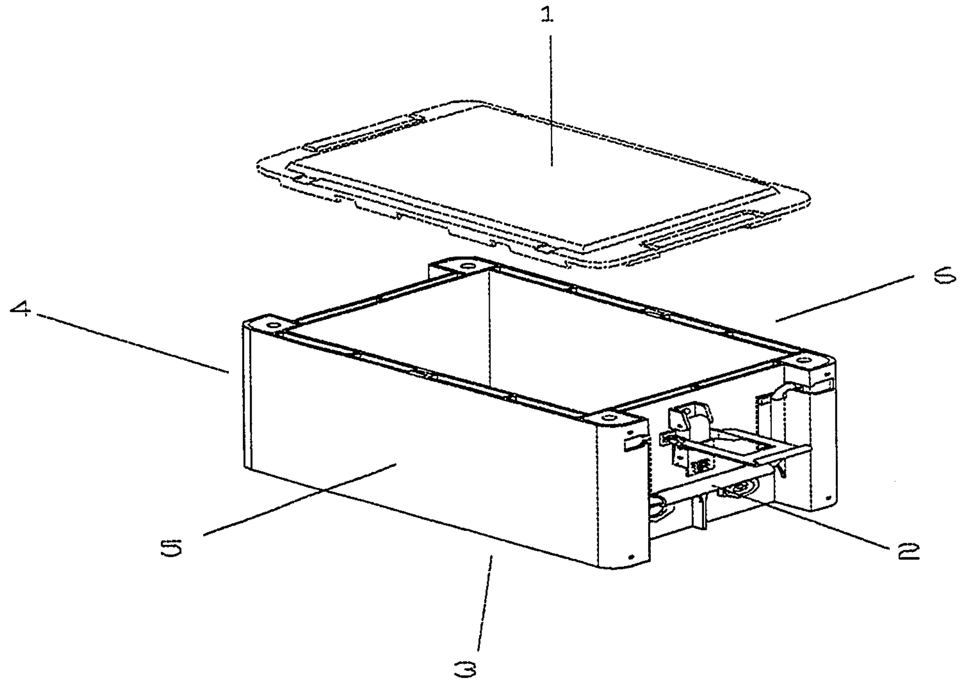

Figure 3. Container Side Coordinates.

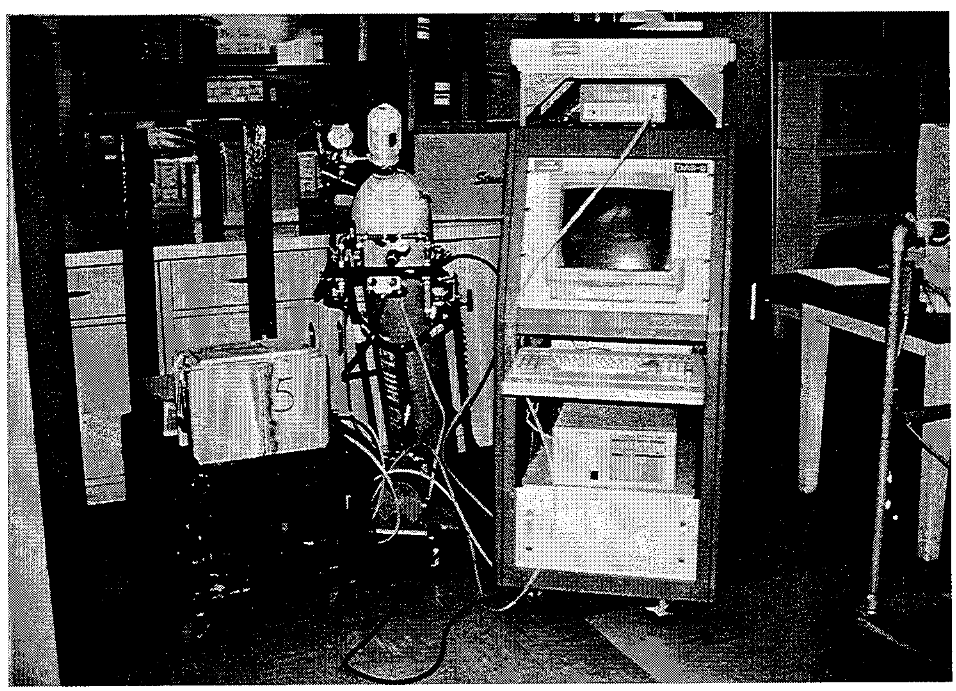

Figure 4. Pneumatic Pressure/Vacuum Retention Leak Test.

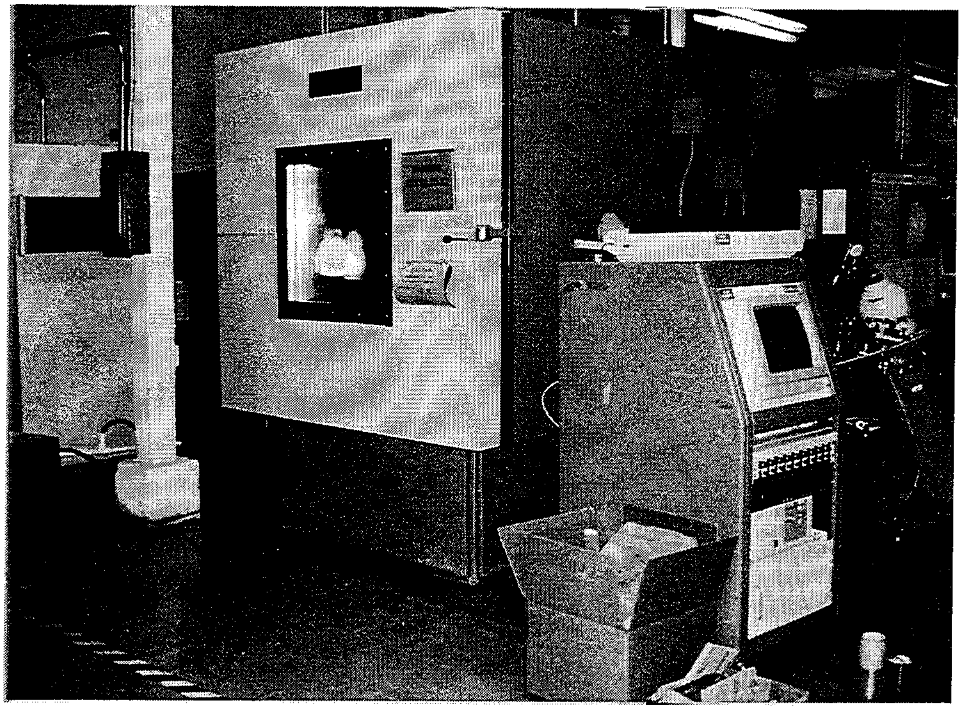

Figure 5. Environmental Chamber.

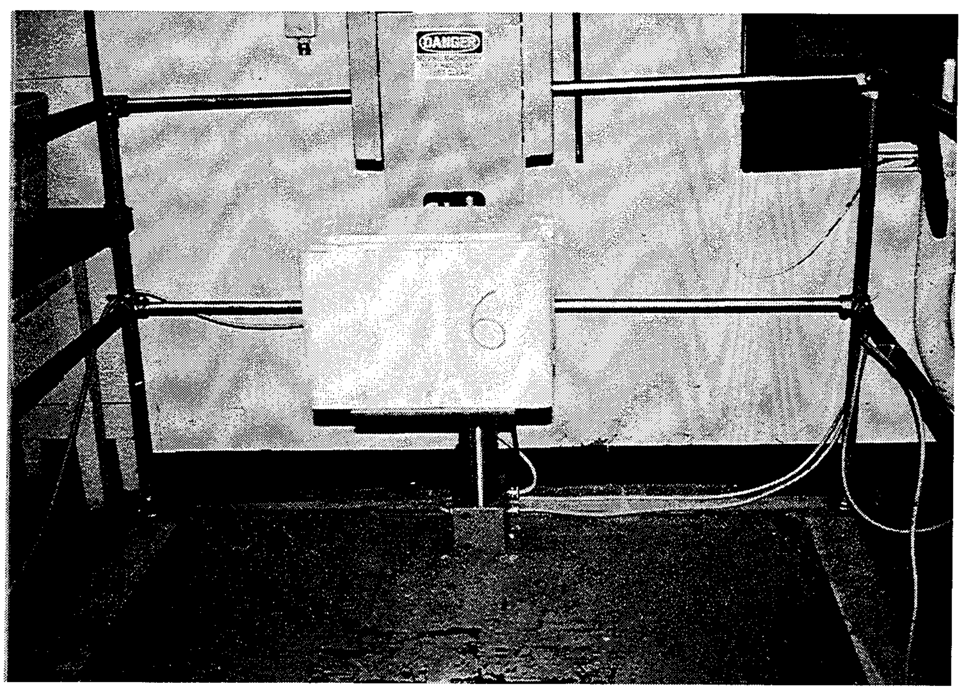

Figure 6. Free Fall Drop Test - Flat Face Drop Test.

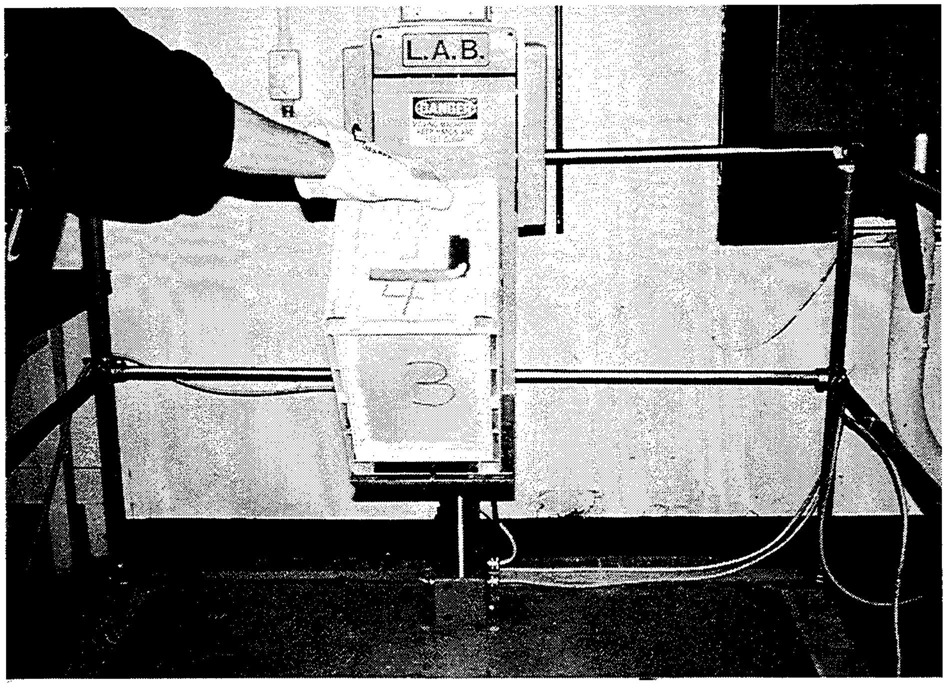

Figure 7. Free Fall Drop Test - Edgewise Drop Test.

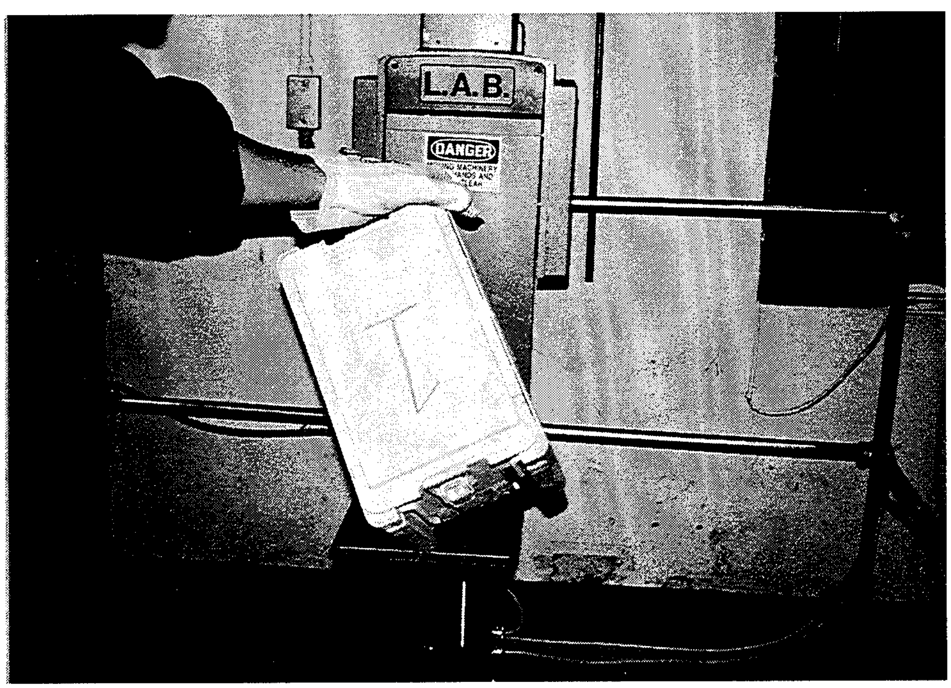

Figure 8. Free Fall Drop Test - Corner wise Drop Test.

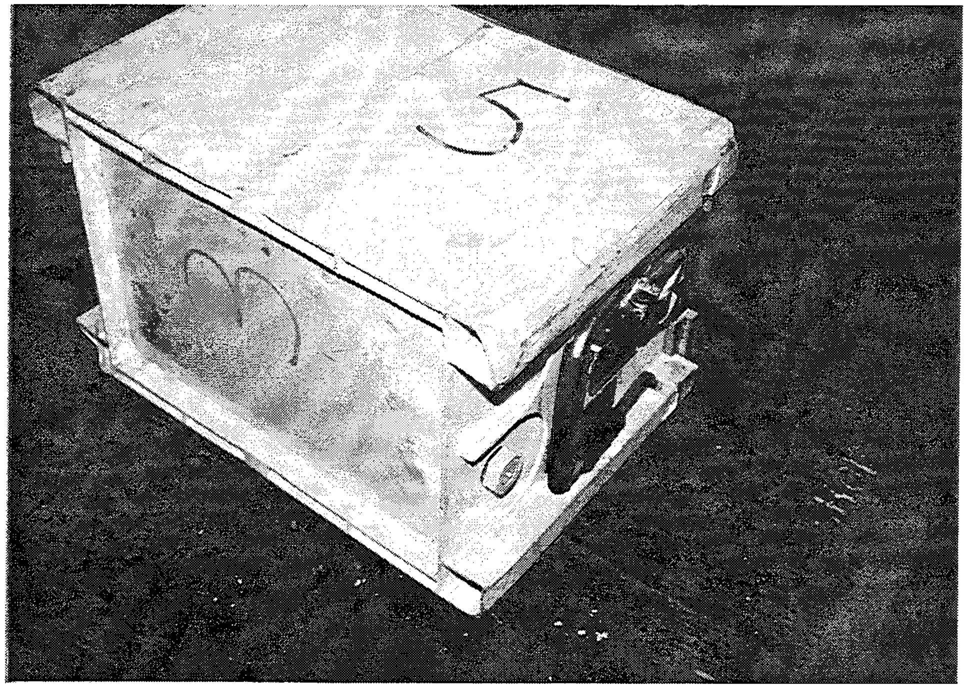

Figure 9. Rounded Container Corners From Drop Tests.

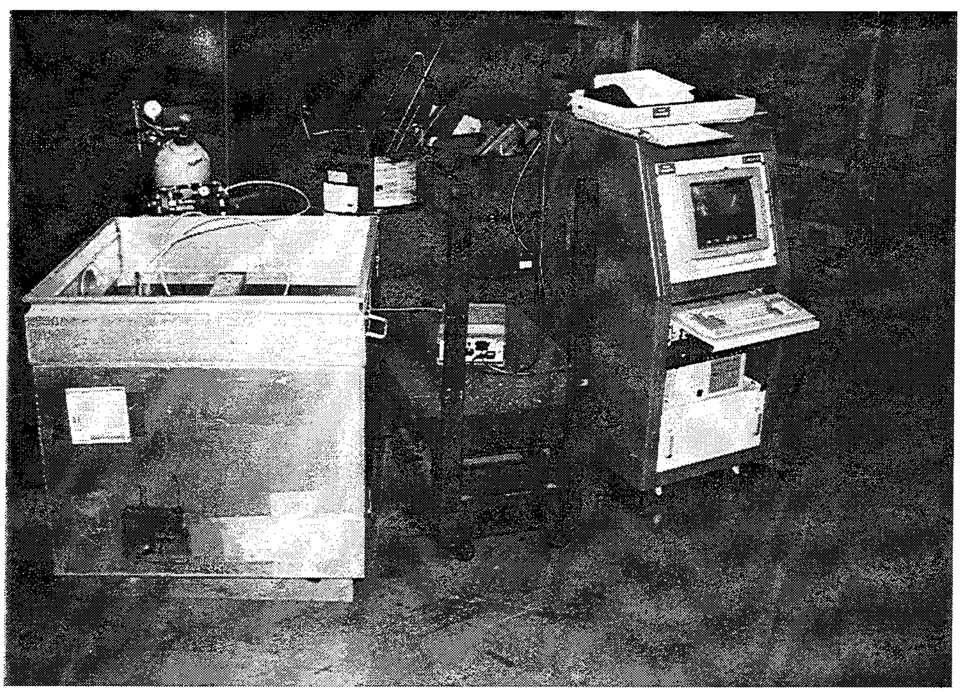

Figure 10. Submersion Leak Test.

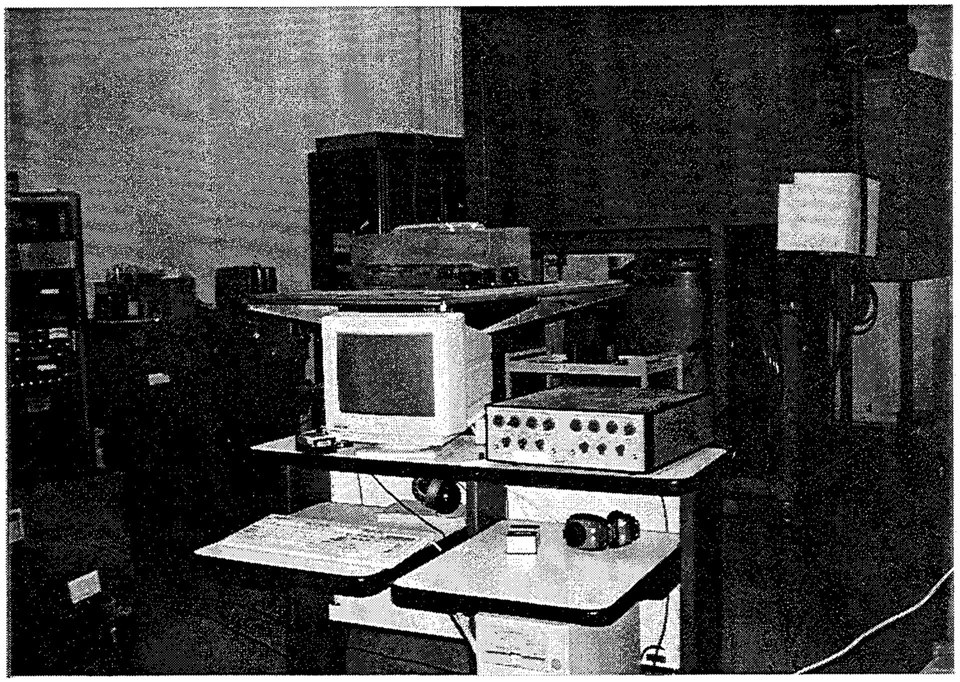

Figure 11. Repetitive Shock Test.

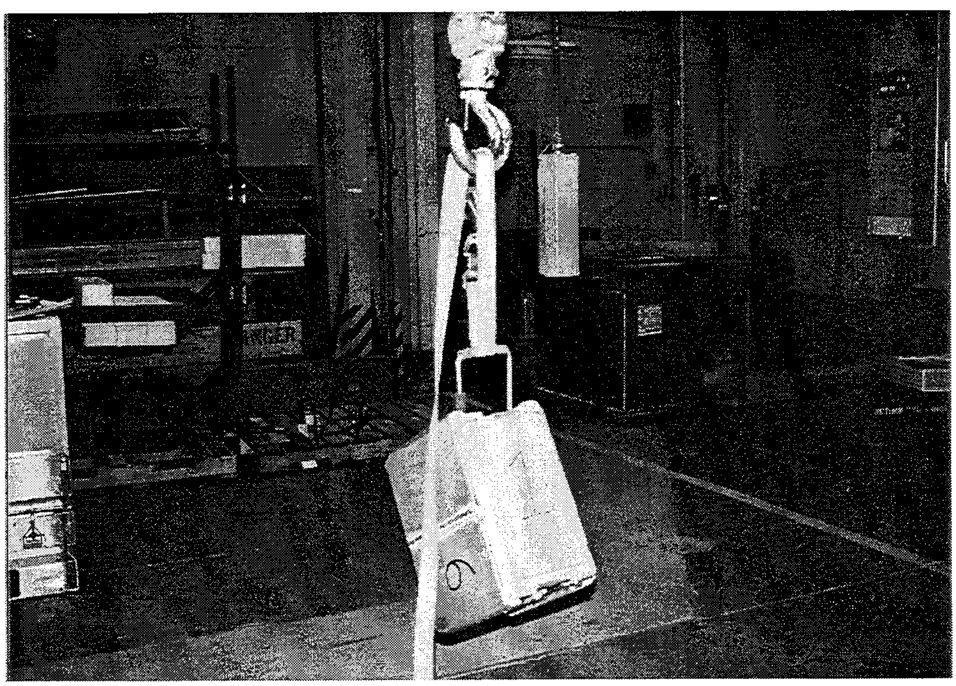

Figure 12. Single Handle Strength Test.

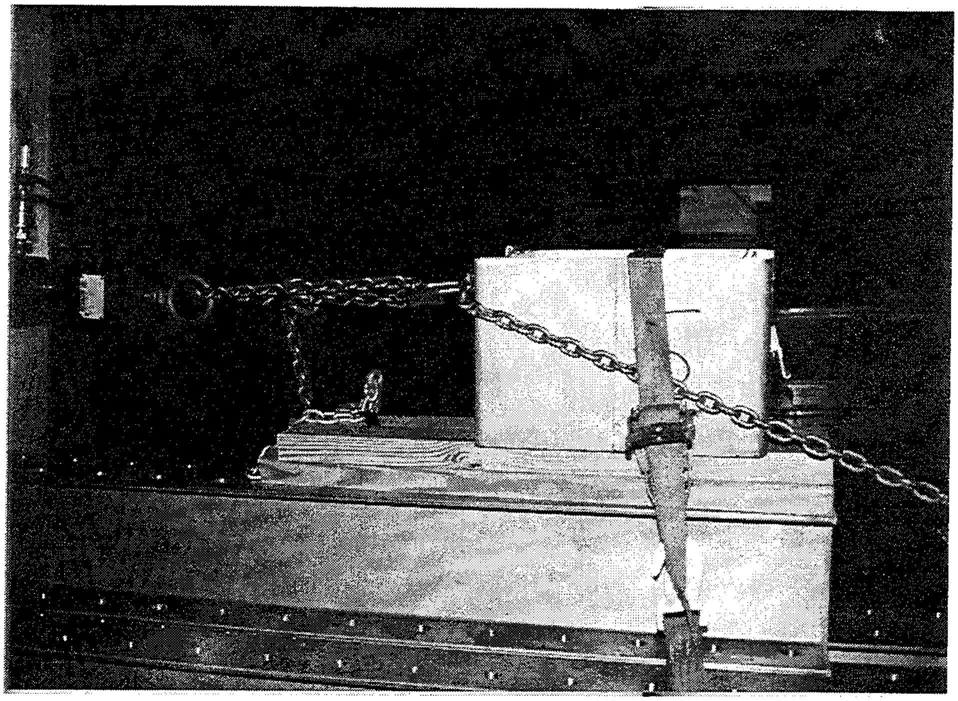

Figure 13. Handle Pull Test - Straight Out.

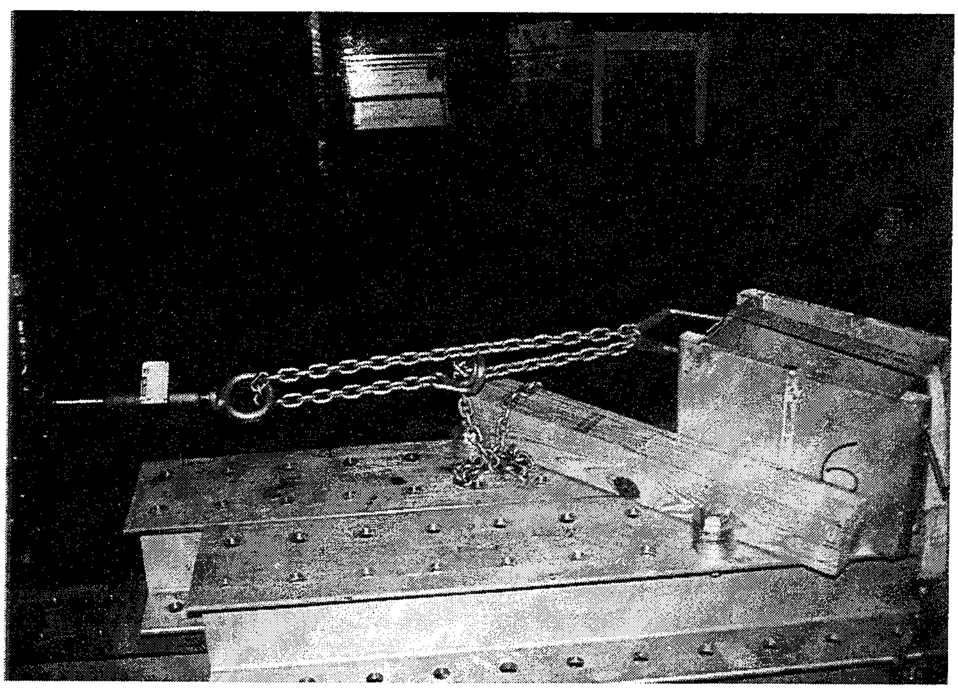

Figure 14. Handle Pull Test - Side Pull.

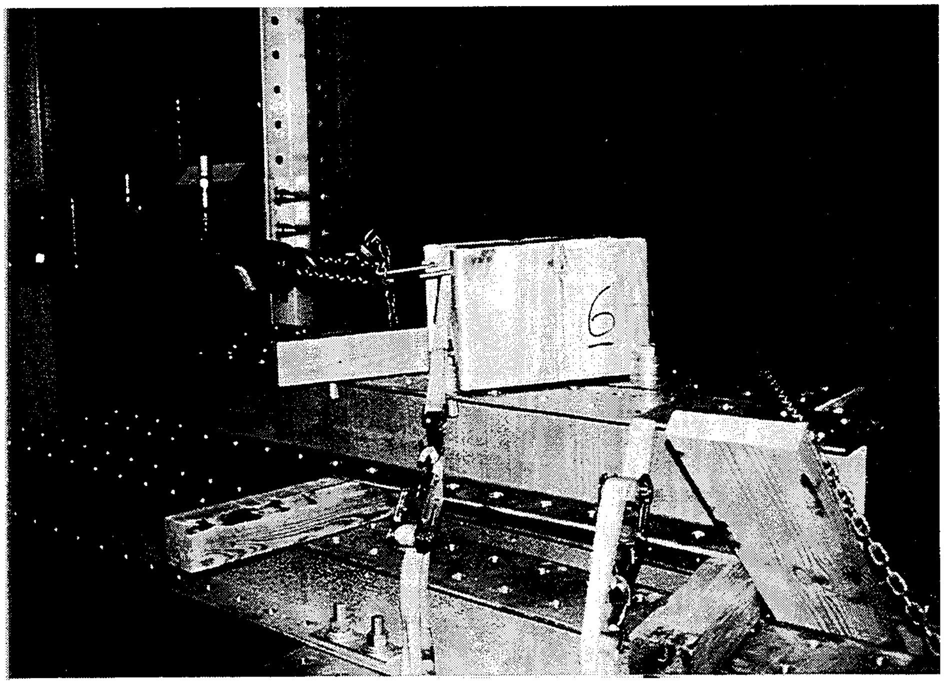

Figure 15. Handle Pull Test - Side Pull.

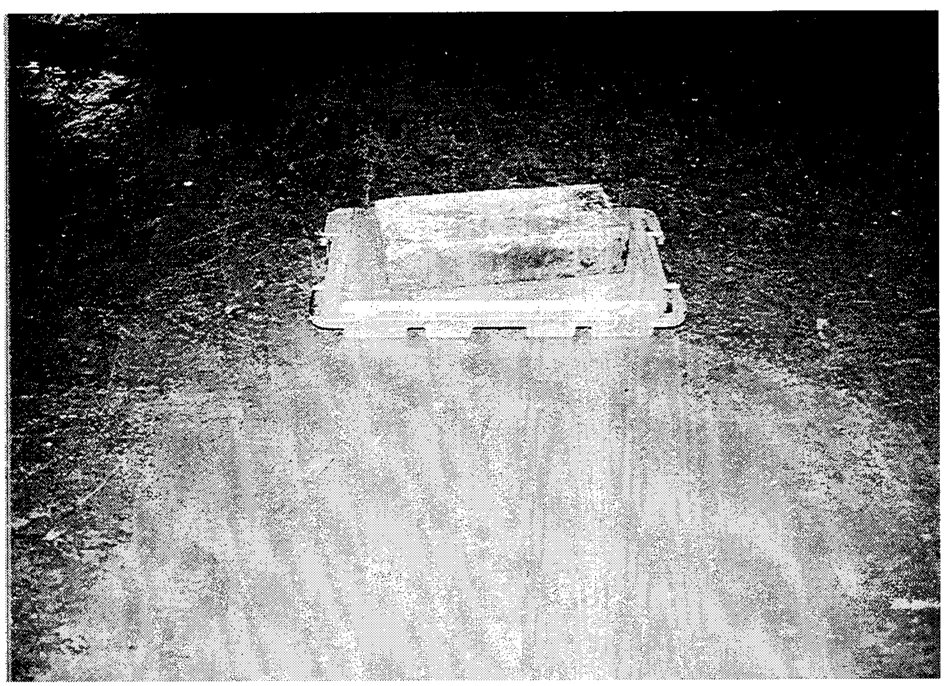

Figure 16. Cover Stand Off Test.

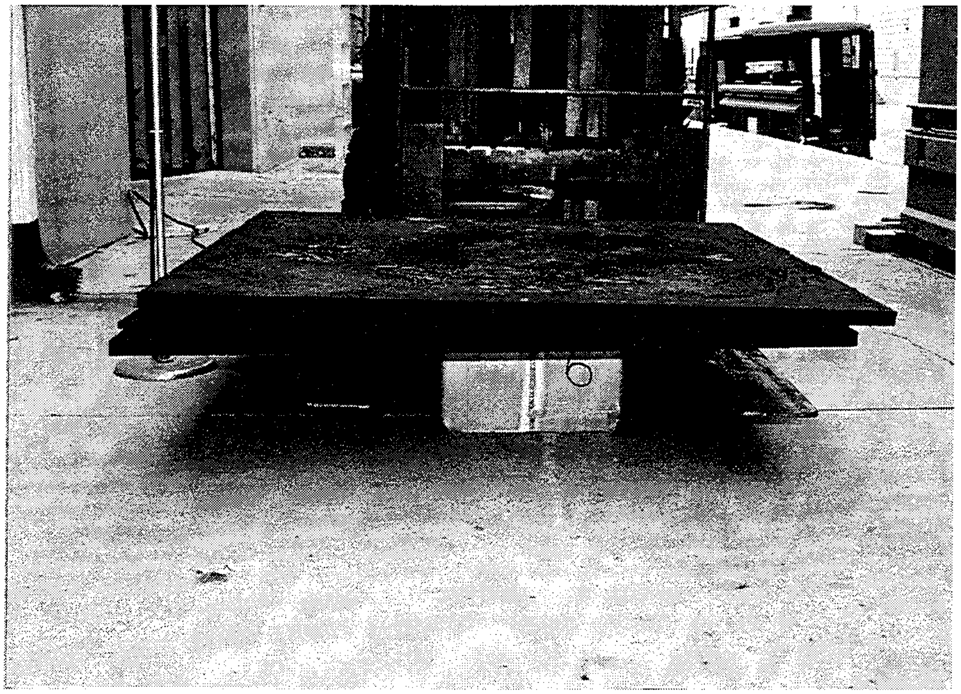

Figure 17. Stack Ability Test.

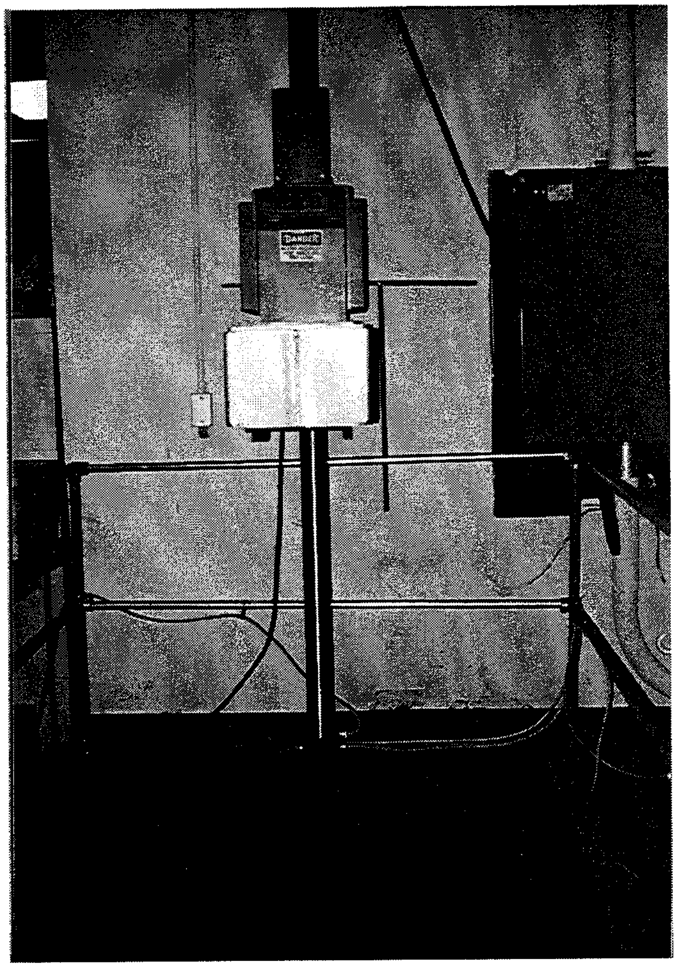

Figure 18. UN Drop Test.

APPENDIX 5

DISTRIBUTION LIST

DISTRIBUTION LIST

DTIC/FDAC CAMERON STATION ALEXANDRIA VA 22304-6145	1
HQ AFMC/LG WRIGHT-PATTERSON AFB OH 45433-5006	1
HQ AFMC/LGT WRIGHT-PATTERSON AFB OH 45433-5006	1
HQ AFMC/LGTP (LIBRARY) WRIGHT-PATTERSON AFB OH 45433-5540	10
HQ USAF/LGTT WASHINGTON DC 20330	1
654 ABG/LGT 7701 SECOND ST, STE 209 TINKER AFB OK 73145-9100	1
654 ABG/LGTP 7701 SECOND ST, STE 209 TINKER AFB OK 73145-9100	1
649 ABG/LGT BLDG 1135 7973 UTILITY DR HILL AFB UT 84056-5713	1
649 ABG/LGTP 7530 11th ST HILL AFB UT 84056-5707	1
651 ABG/LGT BLDG 1530 410 JACKSON RD KELLY AFB TX 78241-5312	1
651 ABG/LGTP 401 WISON BLVD KELLY AFB TX 78241-5340	1
652 ABG/LGT 1961 IDZOREK ST MCCLELLAN AFB CA 95652-1620	1
652 ABG/LGTP 1961 IDZOREK ST MCCLELLAN AFB CA 95652-1620	1
653 ABG/LGT BLDG 376 455 BYRON ST ROBINS AFB GA 31098-1860	1

653 ABG/LGTP BLDG 376 455 BYRON ST ROBINS AFB GA 31098-1860	1
ASC/AWL WRIGHT-PATTERSON AFB OH 45433	1
ASC/ALXS WRIGHT-PATTERSON AFB OH 45433-7642	1
ASC/YJA 110 WACISSA RD SUITE 15 EGLIN AFB FL 32542-5313	1
GSA OFFICE OF ENGINEERING MGT PACKAGING DIVISION WASHINGTON DC 20406	1
COMMANDER ATTN: N KARL (SUP 045) NAVAL SUPPLY SYSTEMS COMMAND WASHINGTON DC 20376-5000	1
COMMANDER ATTN: E PANIGOT (AIR 41212A) NAVAL AIR SYSTEMS COMMAND WASHINGTON DC 20361	1
COMMANDER ATTN: T CORBE (CODE 8218) SPACE AND NAVAL WARFARE SYSTEMS COMMAND WASHINGTON DC 20360	1
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COMMANDING OFFICER ATTN: K POLLOCK (CODE 15611K) NAVAL CONSTRUCTION BATTALION CENTER PORT HUENEME CA 93043	1
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ATTN: F SECHRIST (CODE 0541) NAVY SHIPS PARTS CONTROL CENTER PO BOX 2020 MECHANICSBURG PA 17055-0788	1
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APPENDIX 6

REPORT DOCUMENTATION

REPORT DOCUMENTATION PAGE

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13. ABSTRACT *(Maximum 200 words)*

This report is to document the design and qualification testing of an aluminum container, CNU 532/E, for the shipping & storage of small munitions items like fuses and boosters. The CNU 532/E is a welded aluminum, reusable container. The container is a single person carry with a gross weight of 19.1 Kg (42 Lb.). The CNU 532/E was designed to fullfil a Productivity, Reliability, Availability, Maintainability (PRAM) project 21989-01 suggestion.

14. SUBJECT TERMS
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